

REMARKS

Reconsideration of the present application, as amended, is respectfully requested.

A. STATUS OF THE CLAIMS

As a result of the present amendment, claims 1-20 are presented in the case for continued prosecution.

Claim 1 has been amended to set forth more specifically what Applicants believe to be their invention and further distinctly differentiate the instant invention. Support can be found, for example, in Figures 1, 2, and 4; page 14, lines 5-6; from page 14, line 20 to page 15, line 5; from page 23, line 17, to page 24, line 6; and page 26 lines 6-11.

No new matter has been added.

B. SUMMARY OF INVENTION

The present invention provides a novel arrangement of a blood pump wherein the blood pump actuator comprises a motor unit, a cam unit and a bellows unit. The cam unit comprises a cylindrical cam which encircles the motor and rotates around the motor. The cylindrical cam has a cam guide having a cam surface which varies in axial position around the cylindrical cam. The bellows has a lower bellows extension part which follows the cam surface of the cylindrical cam as the cam rotates around the motor, to convert rotation motion of the motor to rectilinear reciprocating motion of the lower bellows plate to repeatedly expand and contract the bellows. In addition to the overall arrangement of the blood pump, it is the bellows and mechanism of the current blood pump actuator that distinguishes it from prior art.

C. CLAIM REJECTIONS UNDER 35 U.S.C. § 102(b)

On pages 2-5, claims 1-3, 5, 7, 10, and 15-17 as allegedly being anticipated by Heilman (US 6,066,085). Applicants respectfully traverse.

The Examiner has maintained the rejection made on the previous office action and further stated that Heilman's device inherently provides a fluidic pressure output to drive the blood pump considering the closed volume of the bellows 20 operates based on mechanical means compressing and expanding an enclosed compartment, creating air pressure changes that drive fluid in and out of the bellows.

As amended herein, the instant claim 1 provides a blood pump actuator comprising a bellow containing a non-blood fluid to provide fluidic pressure output to drive the blood to be pumped. On the other hand, Heilman does not teach using non-blood fluid nor the cam unit comprising a cylindrical cam which encircles the motor and rotates around the motor or a bellow containing a non-blood fluid.

Further, the novel claimed arrangement is not disclosed by the prior art cited. Applicants respectfully provide below with representative Figures from Heilman and the instant invention for the convenience of the Examiner to compare the distinctive structure of the instant invention.

The primary Heilman reference does not disclose a cam unit comprising a cylindrical cam which encircles the motor and rotates around the motor, or a lower bellows extension part which follows the cam surface of a cam guide, which surface varies in axial position around the cylindrical cam. For example, the cam in Heilman does not encircle the motor, but instead is displaced axially from the motor as shown in its Figure 14, 15 or 17. The cam arrangement is also much different from the claimed arrangement.

Figure 1 of the instant invention (copy shown below) illustrates more clearly that the blood pump actuator 100 and blood pump 200 are distinct bodies, which are connected by connection tube 180. The instant invention allows the placing of the blood pump 200 and blood pump actuator 100 in desirable locations, either farther or closer, connected through connection tube 180.

Heilman	The instant invention
<img alt="Figure 14: A side cross-sectional view of a blood pump assembly. It shows a cylindrical cam 42 positioned above a motor 44. A cam guide 46 is attached to the motor 44. A lower bellows extension part 48 follows the cam surface of the cam guide 46. Reference numerals 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279, 281, 283, 285, 287, 289, 291, 293, 295, 297, 299, 301, 303, 305, 307, 309, 311, 313, 315, 317, 319, 321, 323, 325, 327, 329, 331, 333, 335, 337, 339, 341, 343, 345, 347, 349, 351, 353, 355, 357, 359, 361, 363, 365, 367, 369, 371, 373, 375, 377, 379, 381, 383, 385, 387, 389, 391, 393, 395, 397, 399, 401, 403, 405, 407, 409, 411, 413, 415, 417, 419, 421, 423, 425, 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3513, 3515, 3517, 3519, 3521, 3523, 3525, 3527, 3529, 3531, 3533, 3535, 3537, 3539, 3541, 3543, 3545, 3547, 3549, 3551, 3553, 3555, 3557, 3559, 3561, 3563, 3565, 3567, 3569, 3571, 3573, 3575, 3577, 3579, 3581, 3583, 3585, 3587, 3589, 3591, 3593, 3595, 3597, 3599, 3601, 3603, 3605, 3607, 3609, 3611, 3613, 3615, 3617, 3619, 3621, 3623, 3625, 3627, 3629, 3631, 3633, 3635, 3637, 3639, 3641, 3643, 3645, 3647, 3649, 3651, 3653, 3655, 3657, 3659, 3661, 3663, 3665, 3667, 3669, 3671, 3673, 3675, 3677, 3679, 3681, 3683, 3685, 3687, 3689, 3691, 3693, 3695, 3697, 3699, 3701, 3703, 3705, 3707, 3709, 3711, 3713, 3715, 3717, 3719, 3721, 3723, 3725, 3727, 3729, 3731, 3733, 3735, 3737, 3739, 3741, 3743, 3745, 3747, 3749, 3751, 3753, 3755, 3757, 3759, 3761, 3763, 3765, 3767, 3769, 3771, 3773, 3775, 3777, 3779, 3781, 3783, 3785, 3787, 3789, 3791, 3793, 3795, 3797, 3799, 3801, 3803, 3805, 3807, 3809, 3811, 3813, 3815, 3817, 3819, 3821, 3823, 3825, 3827, 3829, 3831, 3833, 3835, 3837, 3839, 3841, 3843, 3845, 3847, 3849, 3851, 3853, 3855, 3857, 3859, 3861, 3863, 3865, 3867, 3869, 3871, 3873, 3875, 3877, 3879, 3881, 3883, 3885, 3887, 3889, 3891, 3893, 3895, 3897, 3899, 3901, 3903, 3905, 3907, 3909, 3911, 3913, 3915, 3917, 3919, 3921, 3923, 3925, 3927, 3929, 3931, 3933, 3935, 3937, 3939, 3941, 3943, 3945, 3947, 3949, 3951, 3953, 3955, 3957, 3959, 3961, 3963, 3965, 3967, 3969, 3971, 3973, 3975, 3977, 3979, 3981, 3983, 3985, 3987, 3989, 3991, 3993, 3995, 3997, 3999, 4001, 4003, 4005, 4007, 4009, 4011, 4013, 4015, 4017, 4019, 4021, 4023, 4025, 4027, 4029, 4031, 4033, 4035, 4037, 4039, 4041, 4043, 4045, 4047, 40	

Therefore, the instant claim 1, as amended herein, is distinguishable from Heilman in a way explained above and more, and thus, not anticipated by Heilman.

As a result of the amendments and the reasons above, thus, Applicants respectfully request this rejections being withdrawn.

C. CLAIM REJECTIONS UNDER 35 U.S.C. § 103(a)

On pages 5-11, claims 4, 6, 8-9, 11, 12-14, 18-19, and 20 are rejected, as allegedly being obvious over the cited references. Applicants respectfully traverse. All of these rejected claims are depending from claim 1 or its depending claims. Thus, Applicants respectfully would like to draw the Examiner's attention that the scope of these claims to be considered within the limiting scope of the independent claim from which they are depending from, claim 1 in this case. As amended herein, claim 1 provides a noble blood pump actuator, and thus, it is urged that the depending claims should be non-obvious over the cited references, if the independent claim is found to be non-obvious. Nevertheless, Applicants below provide reasons more specifically for each rejection.

On page 5, claim 4 is rejected as allegedly being obvious over Heilman. Applicants respectfully traverse.

In addition to what have been explained above, Heilman does not teach, suggest, or motivate the one skilled in the art to use a non-blood fluid in the blood chamber. It rather discourages and teaches away from using a non-blood fluid in the blood chamber - allegedly the equivalent to the bellows unit of the present invention by focusing on single chamber concept. Applicants respectfully would like to draw the Examiner's attention to column 6, lines 49-52 and 54-57 where Heilman specifically teaches that "as the blood pump **10** squeezes the blood chamber **20**, the blood pump **20** becomes thinner by the volume of ejected blood." (Emphasis added). Also, in column 6, lines 54-57, Heilman states that "this can be a distinct advantage over conventional blood pump assemblies which require an artificial gas filled chamber for compliance."

Thus, it is urged that the instant claim 4 combined with claim 1, as amended herein, is not obvious over Heilman. Applicants would like to respectfully draw the Examiner's attention to the fact that Heilman's teaching is directed to a blood pump itself, while the present invention is a blood

pump actuator that provides the force to drive the blood pump. In addition, in Heilman, it is the mechanic power of the movable plate (28) compressing chamber (20) that drives out the blood. In Heilman, the blood is contained in the compressing chamber (20). In the present invention, the bellows unit within the blood pump actuator generates fluidic pressure, where the fluid is a non-blood fluid, to transfer blood in and out of the blood chamber.

The present invention also provides unexpected advantages. Due to the mechanical structure, the blood pump system of Heilman can cause to destroy blood corpuscles in the blood chamber when the movable plate (28) pushes the blood chamber (20). However, the present invention pumps blood in the blood pump without destroying blood cells, since the blood pump works by the non-blood fluid pressure.

Thus, the instant claim 4 is not obvious over Heilman.

On pages 6-7, claims 6, 8, and 9 were rejected as allegedly obvious over Heilman in view of Murakami (US 5,655,953). Heilman teach a cam guide with sine curve shape while Murakami reference is related to a vehicle compressor required rapid cooling so there is a demand for compressor discharging larger volume without enlarging its size. So Murakami teaches a wave cam compressor where the wave cam surface, during one rotation of the wave cam, has a shape of a double sine wave curve. The teaching of Murakami is focused on a wave cam whose surface is entirely convex in order to prolong the life of the grinding stone. However, the secondary reference fails to remedy the deficiencies of Heilman and combination of the references would not provide a blood pump actuator which contains the features as in the instant claims 1 and 6, 8, or 9. Thus, claims 6, 8 and 9 are not obvious over Heilman in view of Murakami.

On page 7, claim 11 was rejected as allegedly obvious over Heilman in view of Lapeyre (US 4,623,530). The Lapeyre reference does not have a cylindrical cam which encircles and rotates around the motor. Thus, the secondary reference fails to remedy the deficiencies of Heilman and combination of the references would not provide a blood pump actuator which contains the features as in the instant claims 1 and 11. Thus, claim 11 is not obvious over Heilman in view of Lapeyre.

On pages 7-9, claims 12-14 were rejected as allegedly obvious over Heilman in view of Lapeyre and in further view of Dmitruk (SU 816,458). In addition to what was said about Heilman

and Lapeyre above, Dmitruk teach a heat converter for a artificial circulation system. However, Dmitruk fails to remedy the deficiencies of Heilman and combination of the references would not provide a blood pump actuator which contains the features as in the instant claims 1 and any of 12-14. Thus, claim 12-14 are not obvious over Heilman in view of Lapeyre and in further view of Dmitruk.

On pages 9-10, claims 18 and 19 were rejected as allegedly obvious over Heilman in view of Faries (US 7,238,171). Faries teach a system for controlling pressurized infusion of intravenous fluids. However, Faries fails to remedy the deficiencies of Heilman and combination of the references would not provide a blood pump actuator which contains the features as in the instant claim 1 and 18 or 19. Thus, claims 18 and 19 are not obvious over Heilman in view of Faries.

On pages 10-11, claim 20 was rejected as allegedly obvious over Heilman in view of Reinicke (US 4,557,726). Reinicke teach an implantable device for medication dispensing. However, Reinicke fails to remedy the deficiencies of Heilman and combination of the references would not provide a blood pump actuator which contains the features as in the instant claim 1 and 20. Thus, claim 20 is not obvious over Heilman in view of Faries.

As explained above, none of the other secondary references cited appear to disclose the novel claimed feature discussed above to remedy the deficiencies of Heilman. Thus, combination of the cited references would not provide the instantly claimed invention. Furthermore, none of the cited references teach, suggest, or motivate the skilled one in the art to use non-blood fluid, such as air, to pump the blood as in the instant invention. Applicants urge that it would not have been obvious to combine the references as suggested by the Examiner, because the designs are very much different and it has not been shown that the parts could be substituted or modified easily, within the technical grasp of one of ordinary skill in the art.

As a result of the amendment and the reason above, thus, the Applicants urge that claims 4, 6, 8-9, 11, 12-14, 18-19, and 20 are not obvious over the references cited and respectfully request the rejections being withdrawn.

D. FEES

This response is being filed within the shortened period for response with a Request for Continued Examination and the required fee. Thus no further fees are believed to be due. If, on the other hand, it is determined that any further fees are due or any overpayment has been made, the Assistant Commissioner is hereby authorized to debit or credit such sum to Deposit Account No. 02-2275.

Pursuant to 37 C.F.R. 1.136(a)(3), please treat this and any concurrent or future reply in this application that requires a petition for an extension of time for its timely submission as incorporating a petition for extension of time for the appropriate length of time. The fee associated therewith is to be charged to Deposit Account No. 02-2275.

E. CONCLUSION

In view of the actions taken and arguments presented, it is respectfully submitted that each and every one of the matters raised by the Examiner have been addressed by the present amendment and that the present application is now in condition for allowance.

An early and favorable action on the merits is earnestly solicited.

Respectfully submitted,
LUCAS & MERCANTI, LLP

By:



Yun H. Choe
Reg. No. 61,798

LUCAS & MERCANTI, LLP
475 Park Avenue South
New York, NY 10016
Tel.: (212) 661-8000
Fax: (212) 661-8002